

## REMARKS

The premise of the rejection is apparently to hold that the requirements of claim 11 “to reduce grain size” and “to increase crystallization speed” are ineffective limitations because they are functional. To the contrary, functional limitations can be effective where they define the corresponding structure. See M.P.E.P. § 2173.05(g), citing *In re Venezia*. In other words, the claims, as currently pending in the application, define the chalcogenide material as having a species and that species is defined as being one which reduces grain size or one which increases crystallization speed. Therefore, the claims define the species that dope the material to achieve the asserted function.

Nothing in the reference in any way suggests the claimed combination.

For example, based on a review of the Patent Office supplied translation, it is clear that crystallization speed is only adjusted by engineering thermal coefficients, not by any kind of introduced species. The reference to a titanium alloy on page 3 of 6 of the translation is with respect to the film 5, not to the chalcogenide containing film. Clearly, the chalcogenide film is 3 and the reflective film 5 is spaced from that film. Therefore, there is no species introduced into the chalcogenide film to increase crystallization speed. Instead, as explained in paragraph 25 of that reference, the difference in coefficient of thermal expansion controls the crystallization process.

Similarly, the cited reference to Horie teaches titanium, but he uses titanium in the reflective layer as well. As shown in Figures 1A and 1B, the reflective layer is spaced from and different than the recording layer. It is the recording layer that includes the chalcogenide material. The chalcogenide material is 3 and the material with titanium is 2. Thus, it is clear that the chalcogenide does not have a species introduced into the chalcogenide material to reduce grain size. The discussion at paragraph 77, cited in the office action, is with respect to the element M1. Paragraph 77 speaks of using a metal selected from a group including nitrogen to affect crystallization speed. But nothing in the patent application to Horie talks about a species introduced to the chalcogenide material to reduce grain size. Nothing is cited to support the assertion that there is a species introduced into the chalcogenide material to reduce grain size and the only instance where titanium is discussed is believed to be in reference to reflective material,

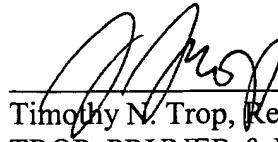
not the chalcogenide material. See paragraph 137. Therefore, reconsideration of the rejection of claims based on Horie is respectfully requested.

An important disadvantage of the nitrogen doped micrograin chalcogenide is a reduction in crystallization speed compared to undoped chalcogenide. This causes an unfavorable tradeoff of programming current and programming speed. Since programming to the set state already requires the longest programming pulse in undoped chalcogenide, further increasing the length of the set pulse with nitrogen doped micrograin chalcogenide can result in greater energy required for the programming pulse, even though the programming current is reduced. In battery operated portable electronic equipment, programming energy is more important than programming current since this directly impacts battery use life.

The claimed invention solves this problem by providing a means of accelerating crystallization speed while maintaining all the advantages of grain refinement in conventional nitrogen doped micrograin chalcogenide. Embodiments use simultaneous doping of nitrogen doped micrograin chalcogenide with titanium which reduces the set time of a conventional chalcogenide alloy. As shown in Figure 4, devices with 400 Angstrom chalcogenide layers deposited on 10 to 20 Angstrom titanium layers exhibit increases of set speed greater than five times. See the specification at page 6, line 25, through page 7, line 8.

Therefore, reconsideration is respectfully requested.

Respectfully submitted,



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